APPENDIX B
USAEHA SAMPLING PROTOCOL

SAMPLING PROTOCOL FOR BUILDING DEMOLITION DEBRIS AND BUILDINGS PAINTED WITH LEAD-BASED PAINT

1. REFERENCES. Appendix A contains a list of the materials referenced in this document.

2. PURPOSE. The procedures outlined in this protocol provide a method of characterization for the solid waste generated during demolition operations through sampling and Toxicity Characteristic Leaching Procedure (TCLP) analyses.

3. BACKGROUND.

a. Since May 1991 (reference 1), problems associated with disposal of construction debris have surfaced at various Army installations. More specifically, these concerns have focused on problems associated with lead-based paint "contaminated" debris from the demolition of World War II era-buildings and other structures known to be contaminated with lead paint. Appropriate sampling and analytical techniques have not been easily defined due to the lack of specific regulatory guidance.

b. A proposed rule, published in the 17 January 1992 Federal Register (FR) (reference 2), cited requirements to test building debris for suspected metal constituents using the TCLP. The proposed rule indicated that a "homogenous" sample, representative of the building, should be obtained from any building scheduled to be demolished. The proposed rule explained that representative proportions of the various building materials (to include glass, wood, cement, brick, roofing material, and any metal piping, utilities, or equipment that will remain in the building at the time of demolition) should be included in the homogenized sample.

c. The final rule, published in the 18 August 1992 FR (reference 3), cited no significant changes. In addition, certain states and even regional U.S. Environmental Protection Agency (EPA) offices have requested that this type of solid waste (i.e., demolition debris) be adequately characterized (references 4-6). Due to the increasing number of installations requesting characterization assistance and the initial feedback from EPA officials (references 7 and 8), a decision was made between various Army agencies (reference 9) to establish a feasible, standardized plan for demolition debris characterization. The plan would outline the appropriate sampling and analytical

procedures to be used by Army installations/activities whenever a demolition debris characterization is needed.

d. The U.S. Army Environmental Hygiene Agency (USAEHA) has developed this generic sampling protocol to assist Army installations/activities in efficiently satisfying the requirements of the new EPA rule in accordance with existing EPA methodologies and guidelines (references 10 and 11). The general approach of this protocol has been verbally approved by the EPA (reference 12). By consistently using this approach, the USAEHA hopes to establish an Army-wide hazardous waste characterization baseline for various types of buildings and structures. The baseline may eventually be used to minimize or eliminate the need for additional sampling and analyses.

e. The USAEHA has been promoting this plan through initial sampling studies (pilot projects) at selected installations. These installations were selected based on the need for immediate waste characterization, the quantity of projected (FY 92) demolition debris, geographic location, and major Army command (MACOM). Appendix B contains brief descriptions of the selected installations and initial findings.

4. SCOPE.

a. Before characterizing the waste, it is necessary to define the wastestream. This protocol defines the wastestream or "population" that is being characterized as the debris generated during a given demolition project at a given site/installation. Demolition projects are typically designated by a given FY; therefore, an installation should have one demolition wastestream generated each year. While all buildings/structures being demolished in a given year constitute the population, only a percentage of these buildings should be sampled. More details on how to determine the appropriate number of buildings to sample are presented in the "PROCEDURE n section below.

b. This protocol and the associated pilot projects are designed to characterize demolition debris from entire buildings. A previous study (reference 13) has shown that certain constituents may appear in more concentrated forms when individual components of buildings are tested. "Small-scale" demolition/construction debris that is generated during maintenance, removal, or other structural modification projects should be individually tested and characterized. In general, this "small-scale" debris should include any demolition/ construction debris that does not involve the entire building. Appendix C contains a brief discussion on disposal procedures for "small-scale" debris.

5. PROCEDURE. During a demolition debris waste characterization study, several site-specific determinations will need to be made. The following steps are detailed to the extent possible.

a. Defining Individual Wastestreams/Populations. As defined above, the wastestream/population will consist of all the debris generated during a specified demolition project. A list of the

buildings should include notations of buildings that are identical. Information should also be gathered regarding the demolition and disposal procedures. For instance, if the structures are set on cement foundations it would be necessary to determine whether the cement is to be demolished and disposed of with the rest of the debris. If such foundations were to be left in place they would not be considered as debris; otherwise, they would be included in the wastestream and would be sampled in accordance with the procedures discussed below.

b. Determining the Number of Samples. Based on EPA guidance (reference 10), a statistical approach will be used to determine the number of buildings that need to be sampled. This approach is based on the assumption that the buildings are all of a relatively unique population and that the analytical results of the study will be normally distributed. The EPA manual SW-846 - Test Methods for Evaluating Solid Wastes (reference 11), requires that the number of samples and statistical parameters used to characterize a 'population' ensure an 80 percent confidence level in the resulting determination (in this case, hazardous or nonhazardous). The Table is based on these guidelines and should be used to determine the number of buildings to be sampled in a given population:

c. Sample Buildings Selection. Once the number of buildings to be sampled has been determined, the specific buildings to be sampled need to be identified. A somewhat random approach should be used in the selection process. Buildings may be randomly selected using building numbers or placement on maps. However, when one or more groups of identical buildings (e.g., a set of WWII barracks, all painted the same, maintained the same, etc.) constitutes a portion of the population, an appropriate percentage of buildings should be selected from the individual group(s).

d. Samplinq Strategy. The objective is to obtain one composite sample from each selected sample building. The composite sample should include appropriate proportions of all materials constituted within the structure. The Figure depicts various areas of a building that may be constructed of different materials and should be sampled.

(1) Building components, such as glass, screen, or wiring, that are difficult to sample and comprise a very small percentage of the overall structure, will not be sampled. Also, materials such as aluminum siding, large metal ductwork, light ballasts, utility equipment, and asbestos insulation should not be sampled as these materials should be separated from the demolition debris and disposed of separately or recycled/reused (e.g., scrap metal). In general, the most commonly sampled components will be wood, brick, cement and plaster/wallboard.

(2) The proportional size of the various building areas based on (estimated) square footage must be determined. For instance, a building may be 70 feet long, 40 feet wide and 12 feet high; if all four of the exterior walls are made of the same material, there is 2,640 ft2 of that material/component. Window

and door space should be subtracted out from the exterior/interior walls and considered as separate areas. The total estimated areas of the individual areas (e.g., exterior wall, interior plaster board wall, interior plywood/panelling wall, floor, cinder block supports, etc.) should be compared to one another in order to establish ratios. The ratios will determine the number of subsamples to obtain from each individual area. Generally, 20 to 30 subsamples are necessary to makeup one 110-gram sample. This number will vary based on the types of materials in the building.

TABLE. STATISTICAL DETERMINATION OF THE NUMBER OF BUILDINGS TO BE SAMPLED

NO. OF TOTAL BUILDINGS	NO. OF BUILDINGS TO SAMPLE*
1 - 9	ALL
11 - 15	10
16 - 20	13
21 - 30	16
31 - 40	21
41 - 100	26
> 100	32

* These numbers are designed to meet or exceed the statistical requirements set by EPA. Both the power and the confidence intervals (CI's) were set at or above 90 percent and 80 percent, respectively, and the precision was established as 20 percent. The coefficient of variance (CV) is assumed to be 35 percent. The actual CV will vary from case to case and should be determined when the analytical results are available. A complete statistical evaluation of the analytical data will involve a calculation of the actual CV and potentially include data transformations and/or adjustments to the other statistical parameters (see the "DATA ANALYSES" section below).

Figure
Example Diagram of a Building
(WWII Temporary Barracks Slated for Demolition)

Not Available Online

e. Sampling Methodology.

(1) Using a 1-inch bit drill or similar device, a "core" subsample should be obtained from the selected areas of the building. The subsample material should be collected into a disposable container (such as large sheets of paper) as the

drilling is done. The sampling crew should -- to the extent feasibly possible -- drill through the entire substrate. For building components such as cinder block or cement a hammer drill should be used. The number of drill holes obtained from each type of surface/area should be recorded. If the amount of overall sample material is not enough (i.e., less than 110 grams) for the TCLP, additional subsamples should be obtained from each of the specific areas. [NOTE: For at least 5 percent of the samples (and a minimum of 1 sample), approximately 300 grams should be obtained for adequate split laboratory analyses.]

(2) Field duplicates, equaling 5 percent of the number of actual samples (at a minimum of one), should be obtained to check the sampling practice. The duplicate(s) should be obtained by simultaneously filling two sample containers during the sample process (i.e., for each subsample within a sample building, two adjacent cores should be obtained and placed into two separate containers).

f. Collection and Labelling. The sample material from each building should be collected onto a (disposable) container (such as sheets of unused paper, paper plates, etc.). From this collection container, the materials should be emptied into clean (new) plastic baggies and labelled with the project/installation name and or identification number, sample (building) number, sample date, and sampling personnel's name.

g. Decontamination. Nondedicated sampling equipment such as the drill bit should be decontaminated between sampling of individual buildings. The sampling crew should first brush excess material from the equipment and then wash using tap water and soap. This should be followed by a final rinse with distilled, deionized, filtered (DDIF) water. To ensure the equipment was properly decontaminated, a used rinse water sample should be taken and analyzed.

6. LABORATORY ANALYSES.

a. Packaginq and Transportation. All samples should be properly packaged before transporting them to the certified analytical laboratory.

b. Laboratory Preparation. To ensure thorough mixing of the material, the laboratory should be requested to thoroughly mix/homogenize the sample material before preparing it for analyses. This will minimize the 'settling' that may occur during transportation. This procedure is extremely important when excess sample has been obtained and the laboratory will only be using a portion of the overall sample.

c. Analytical Methodology. All solid (wood/plaster/ paintchip, etc.) samples should be extracted using EPA Method 1311 (TCLP). The samples should be analyzed using either EPA Method 6010A [Inductively Coupled Plasma (ICP)-Atomic Emission Spectroscopy] or EPA Method 7421, the Atomic Absorption, Furnace Technique for lead. The ICP procedure is recommended due to lower cost, but either method will satisfy EPA requirements

(reference 14). The rinsate sample should also be analyzed using one of these methods.

7. DATA ANALYSES.

a. The TCLP laboratory results should be statistically analyzed to assess the variability among the structures and overall normality of the lead distribution. If the analytical results do not indicate a normal distribution (i.e., the arithmetic mean is not greater than the variance), the raw data should be transformed (reference 11). After normality has been achieved through an appropriate transformation, the 80 percent CI should be calculated and compared to the (similarly transformed) regulatory threshold (RT) of 5.0 mg/L of lead (reference 11).

b. Additional procedures may be necessary to address potential "statistical outliers," or buildings that yield unusually high TCLP lead concentrations that dramatically skew the 80 percent CI. If necessary, such buildings may be addressed as a separate population.

8. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC). The QA/QC measures for this sampling effort includes the field duplicate(s), rinsate sample, and laboratory duplicate(s). These measures are all in accordance with EPA guidance (reference 10).

9. SITE SAFETY PROCEDURES. A Site Safety and Health Plan (SSHP) must be established to ensure safe working conditions for personnel performing the procedures outlined in this protocol. An SSHP summarizes the potential hazards and safety procedures during sample collection at the subject buildings. Appendix D includes an example of an SSHP.

10. COORDINATION AND MONITORING. Analytical results obtained using this protocol or a similar approach are being requested for placement in a database. Future sampling of building demolition debris may be minimized or even eliminated based on such results. Personnel using this protocol may direct any questions, comments, or results to Ms. Veronique Hauschild of the Waste Disposal Engineering Division, USAEHA, at DSN 584-2953, commercial (410) 671-2953, or forward same to the address below:

COMMANDER
USAEHA
ATTN: HSHB-ME-SH (V.Hauschild)
BLDG 1677
APG - EA, MD 21010-5422

APPENDIX A

REFERENCES

1. Memorandum, FORSCOM, FCEN-CED-E, 17 May 1991, subject:

Disposal of Waste Construction Debris Containing LeadContaminated Paint.

2. Proposed Rule, Land Disposal Restrictions for Newly Listed Wastes and Contaminated Debris, 57 Federal Register 958, 9 January 1992.

3. Final Rule, Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris, 57 Federal Register 37194, 18 August 1992.

4. Memorandum, AFZD-DEQ, 10 May 1991, subject: Lead Paint Compliance Strategy [re: State of Massachusetts and EPA Region Stance on Waste Characterization.

5. Letter, State of Maryland Department of the Environment, 23 December 1991, re: Characterization of Lead-Based Paint Debris (at Aberdeen Proving Ground).

6. Letter, Alabama Department of Environmental Management, 8 May 1992, re: Demolition of Buildings Painted with Lead-Based Paint (at Fort McClellan).

7. Telephone conversation between Ms. Elaine Ebeye, Treatment and Technologies Branch - Office of Solid Waste (OSW), EPA, and Ms. V. Hauschild, U.S. Army Environmental Hygiene Agency (USAEHA), January 1992.

8. Telephone conversation between Mr. Jim Thompson, Enforcement Division, EPA, and Ms. V. Hauschild, USAEHA, January 1992.

9. Memorandum, ENVR-EH, 22 May 1992, subject: Analysis and Disposal of Construction Debris (Army Environmental Office requesting assistance from USATHAMA and USAEHA).

10. EPA/600/8-89/046, March 1989, Soil Sampling Quality Assurance User's Guide, 2nd Edition.

11. EPA Manual SW-846, November 1986, Test Methods for Evaluating Solid Waste (Volume II), 3rd Edition.

12. Telephone conversation between Mr. Dave Topping, OSW, and Ms. V. Hauschild, USAEHA, 28 August 1992.

13. Memorandum, USAEHA, HSHL-ME-SH, 27 March 1992, subject: Hazardous Waste Study No. 37-26-J105-91, Characterization of Demolition Debris Containing Lead-Lased Paint.

14. EPA Manual SW-846, Revision 1 November 1990, Test Methods for Evaluating Solid Waste, (Volume I, Part A), 3rd Edition.